

Appl. No.: 10/052,248
Amdt. dated: October 28, 2003
Reply to Office action of: July 14, 2003

This listing of claims will replace all prior versions, and listings of claims in this application:

Listing of Claims:

1(canceled). A protection device for monitoring current in a power cable to an electrical device and for controlling a starter for the electrical device in response to a system remotely located controller, the protection device comprising:

- (a) a transformer magnetically linked with said power cable connected to said electrical device, said transformer producing a voltage signal in response to the presence of a changing current within said power cable;
- (b) an input circuit located proximate to said transformer and having an output terminal and being electrically connected to said transformer so as to receive said voltage signal, said input circuit producing, in response to receiving said voltage signal, one of a first signal representative of said changing current, and a first circuit condition at said output terminal of said input circuit representative of said changing current in said power cable;
- (c) a switch circuit for sensing one of a second signal and a second circuit condition of a remotely located system controller and providing one of a third signal and a third circuit condition, in response to sensing one of said second signal and said second circuit condition, said third signal and said third circuit condition being effective to control said starter when said starter is electrically connected thereto; and,
- (d) all of said transformer, said input circuit, and said switch circuit being located in a single unitary package.

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2 (canceled). The protection device of claim 1 wherein said transformer includes a wire-wrapped toroidal core at least partially encircling said power cable.

3 (canceled). The protection device of claim 1 where said toroidal core has a low magnetic permeability.

4 (canceled). The protection device of claim 1 wherein said first signal is a current signal.

5 (canceled). The protection device of claim 4 wherein said current signal has a range of magnitude from about 4 ma to about 20 ma.

6 (canceled). The protection device of claim 1 wherein said first signal is a voltage signal.

7 (canceled). The protection device of claim 6 wherein said voltage signal has a range of magnitude from about 0 volts to about 5 volts.

8 (canceled). The protection device of claim 1 wherein said first circuit condition is one of a short circuit and an open circuit.

9 (canceled). The protection device of claim 1 wherein said system controller is a programmable logic device.

10 (canceled). The protection device of claim 1 wherein said second signal is a direct current signal.

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11 (canceled). The protection device of claim 1 wherein said second signal is a alternating current signal.

12 (canceled). The protection device of claim 1 wherein said second signal is a direct voltage signal.

13 (canceled). The protection device of claim 1 wherein said second signal is an alternating voltage signal.

14 (canceled). The protection device of claim 1 wherein said switch circuit includes a relay electrically connected to said system controller to sense said one of a second signal and second circuit condition.

15 (canceled). The protection device of claim 1 wherein said switch circuit includes a triac electrically connected to said system controller to sense said one of a second signal and second circuit condition.

16 (canceled). The protection device of claim 1 wherein said switch circuit includes an opto-isolator device to optically isolate said system controller from said starter.

17 (canceled). The protection device of claim 1 wherein said switch circuit includes a rectifier circuit to rectify said second signal.

18 (canceled). The protection device of claim 1 wherein said third circuit condition is a short circuit.

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19 (canceled). The protection device of claim 1 wherein said third circuit condition is an open circuit.

20 (new). A protection device suitable for monitoring current in a cable to an electrical device and for controlling said electrical device in response to a remotely located controller, the protection device comprising:

- (a) a sensing device suitable to produce an input signal in response to the presence of a changing signal within said cable;
- (b) a first circuit located proximate to said sensing device that receives said input signal, said input circuit producing, in response to receiving said input signal, at least one of an open circuit condition and a short circuit condition;
- (c) a second circuit for sensing at least one of a controller signal and a controller circuit condition of said remotely located controller and providing at least one of an output signal and an output circuit condition, in response to sensing said at least one of said controller signal and said controller circuit condition, said at least one of said output signal and said output circuit condition being suitable to control said electrical device; and,
- (d) all of said sensing device, said first circuit, and said second circuit being located in a single unitary package.

21 (new). The protection device of claim 20 wherein said sensing device is a transformer with a toroidal core with a low magnetic permeability.

22 (new). The protection device of claim 20 wherein at least one of said output signal and said output circuit condition being effective to control a starter when said starter is electrically connected thereto.

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23 (new). The protection device of claim 20 wherein said controller signal is a direct current signal.

24 (new). The protection device of claim 20 wherein said controller signal is an alternating current signal.

25 (new). The protection device of claim 20 wherein said controller signal is a direct voltage signal.

26 (new). The protection device of claim 20 wherein said second signal is an alternating voltage signal.

27 (new). The protection device of claim 20 wherein said second circuit includes a relay electrically connected to said remotely located controller to sense said one of a controller signal and a controller circuit condition.

28 (new). The protection device of claim 20 wherein said second circuit includes a triac electrically connected to said remotely located controller to sense said at least one of a controller signal and a controller circuit condition.

29 (new). The protection device of claim 20 wherein said second circuit includes a rectifier circuit to rectify said controller signal.

30 (new). The protection device of claim 20 wherein said output circuit condition is an open circuit.

31 (new). The protection device of claim 20 wherein said output circuit condition is a short circuit.

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32 (new). The protection device of claim 20 wherein said sensing device is a transformer.

33 (new). The protection device of claim 32 wherein said transformer includes a wire-wrapped torodial core.

34 (new). The protection device of claim 33 wherein said toroidal core at least partially encircles said power cable.

35 (new). A method of monitoring current in a cable to an electrical device and for controlling said electrical device in response to a remotely located controller, comprising:

- (a) producing by a sensing device an input signal in response to the presence of a changing signal within said cable;
- (b) receiving said input signal by a first circuit located proximate to said sensing device, producing by said input circuit, in response to receiving said input signal, at least one of an open circuit condition and a short circuit condition;
- (c) sensing by a second circuit at least one of a controller signal and a controller circuit condition of said remotely located controller and providing at least one of an output signal and an output circuit condition, in response to sensing said at least one of said controller signal and said controller circuit condition, said at least one of said output signal and said output circuit condition being suitable to control said electrical device; and
- (d) locating all of said sensing device, said first circuit, and said second circuit in a single unitary package.

36 (new). The protection device of claim 35 wherein said output circuit condition is at least one of a short circuit and an open circuit.

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37 (new). The protection device of claim 35 wherein said sensing device is a transformer with a toroidal core with a low magnetic permeability.

38 (new). The protection device of claim 35 wherein at least one of said output signal and said output circuit condition being effective to control a starter when said starter is electrically connected thereto.

39 (new). The protection device of claim 35 wherein said controller signal is a direct current signal.

40 (new). The protection device of claim 35 wherein said controller signal is an alternating current signal.

41 (new). The protection device of claim 35 wherein said controller signal is a direct voltage signal.

42 (new). The protection device of claim 35 wherein said second signal is an alternating voltage signal.

43 (new). The protection device of claim 35 wherein said second circuit includes a relay electrically connected to said remotely located controller to sense said one of said controller signal and said controller circuit condition.

44 (new). The protection device of claim 35 wherein said second circuit includes a triac electrically connected to said remotely located controller to sense said at least one of said controller signal and said controller circuit condition.

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45 (new). The protection device of claim 35 further comprising said controller receiving said at least one of said open circuit condition and said short circuit condition and in response providing said at least one of said controller signal and said controller circuit condition.

46 (new). The protection device of claim 45 wherein said controller in said response also providing another at least one of another controller signal and another controller circuit condition to another said second circuit.

47 (new). The protection device of claim 35 wherein said sensing device is a transformer.

48 (new). The protection device of claim 47 wherein said transformer includes a wire-wrapped torodial core.

49 (new). The protection device of claim 48 wherein said toroidal core at least partially encircles said power cable.